



EUROPEAN CENTRAL BANK

EUROSYSTEM

Michael Ehrmann
European Central Bank

Gaetano Gaballo
Banque de France

Peter Hoffmann
European Central Bank

Georg Strasser
European Central Bank

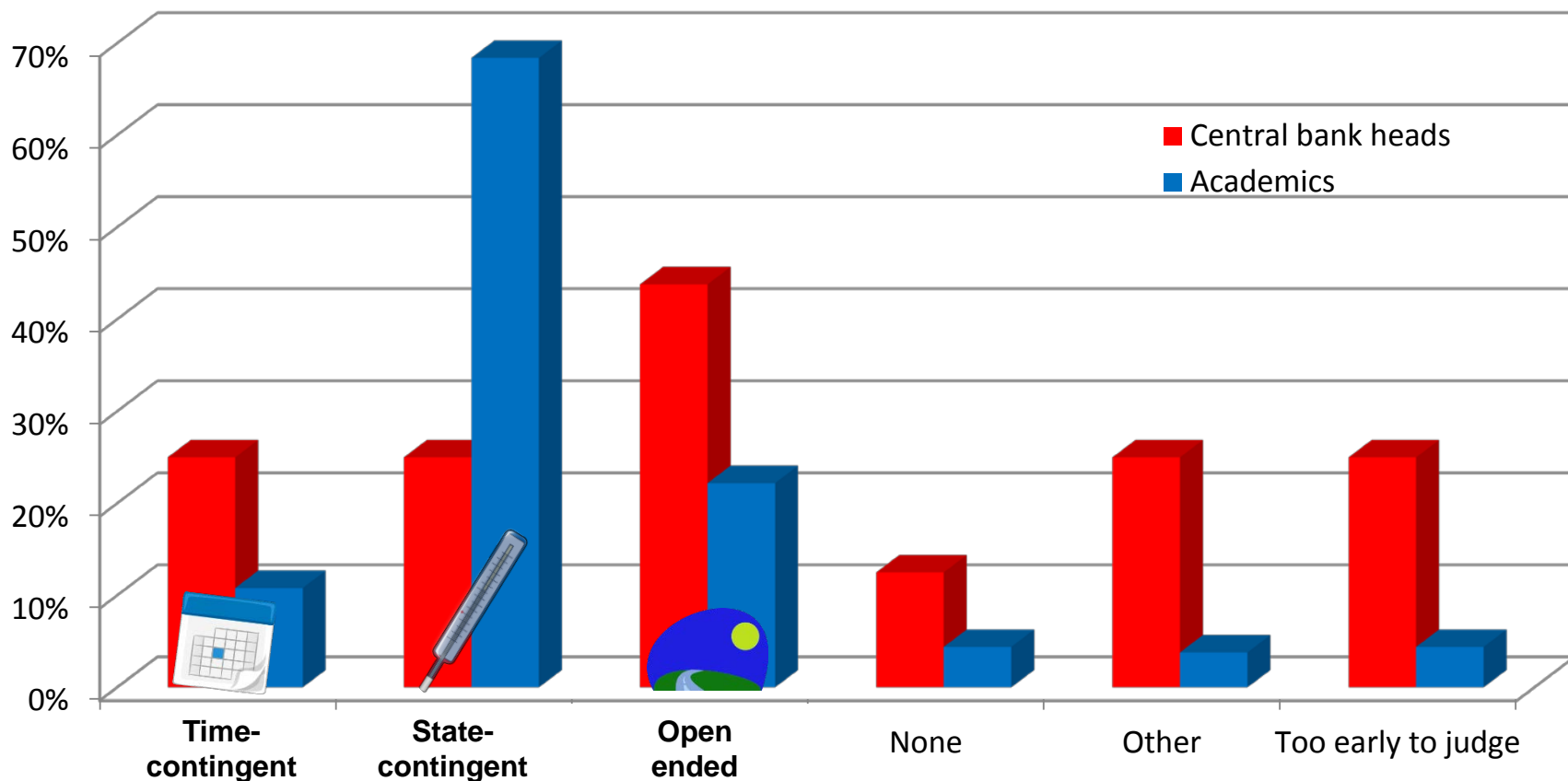
Can more public information raise uncertainty? The international evidence on forward guidance

Challenges in Understanding the
Monetary Transmission Mechanism
22 March 2019

The views expressed here are our own and do not necessarily reflect those of the ECB, the Banque de France or the Eurosystem.

- Forward guidance (FG) as policy tool to
 - Provide additional accommodation (at the lower bound)
 - Anchor **expectations**, e.g. about policy rates
 - Reduce **uncertainty**, e.g. about policy rates
- But multifaceted **ongoing discussions**:
 - FG puzzle (Del Negro, Giannoni, and Patterson, 2015)
 - Critical views by some central bankers (Poloz 2014)
 - **Does the form of FG matter?**
 - (How to exit from FG?)

Preferred types of forward guidance in the future



Source: Blinder et al. (2017) survey among central bank governors (55 responses) and academic economists (159 responses).

“In the future, which type(s) of forward guidance do you believe would be most effective for your central bank?”



Does the form of forward guidance (FG) matter?

- E.g. its strength (or horizon)?



Can more public information be detrimental (Amador and Weill, JEP 2010)?




- How to explain FG experience?

Cross-country FG experience allows studying how the effect of a public announcement depends on implementation

- 1) **Effect of FG is nonlinear in the strength of guidance.**
 - Short-horizon time-contingent FG can elevate uncertainty (relative to no FG),
 - But long-horizon time-contingent FG cements expectations
- 2) **Rational expectations with noisy market information** explain how “weak” FG can raise responsiveness to news.
 - Public and private signals on fundamentals become relatively more informative
 - Agents react less to market prices
- 3) Also explains **cross-country evidence on the different effects of the various types of FG.**
 - State-contingent FG mutes responsiveness of rate expectations to news
 - Open-ended FG ineffective

- **Effect of FG**
(Campbell et al. BREA 2012, Swanson and Williams 2014, Feroli et al. 2017)
- **Learning from prices**
(Vives 1997, Amador and Weill 2012, Vives 2017, Veldkamp 2011)
- Welfare loss by more precise public information due to **coordination**
(Morris and Shin 2002; Angeletos and Pavan 2007, Hellwig 2005, Paciello and Wiederholt 2013, Angeletos et al. 2016)
- Welfare loss by more precise public information due to **externalities in the information structure**
(Morris and Shin 2005, Amador and Weill 2010)
(Related mechanisms : Amato et al. 2002, Amato and Shin 2006, Wong 2008, Gaballo 2016)

- 1** Effect of forward guidance on responsiveness of bond yields
- 2** Rational expectations model with noisy market information
- 3** Summary

- FG affects expectations about future policy rates
(Swanson and Williams 2014, Feroli et al. 2017)
- Test whether the **form of FG** matters for uncertainty.
 -  Open-ended FG (e.g. “for an extended period”)
 -  State-contingent FG
 -  Time-contingent FG: short vs. long horizon

Does the form of FG change the responsiveness of bond yields to surprises in macroeconomic indicators?

- 7 advanced economies until November 2016

- Periods with policy rates at or below 1%

Reduced responsiveness at ELB (Swanson & Williams 2014)

- **Classify by FG regime**



Open-ended FG:

Euro Area, Sweden, Japan, UK, USA



State-contingent FG:

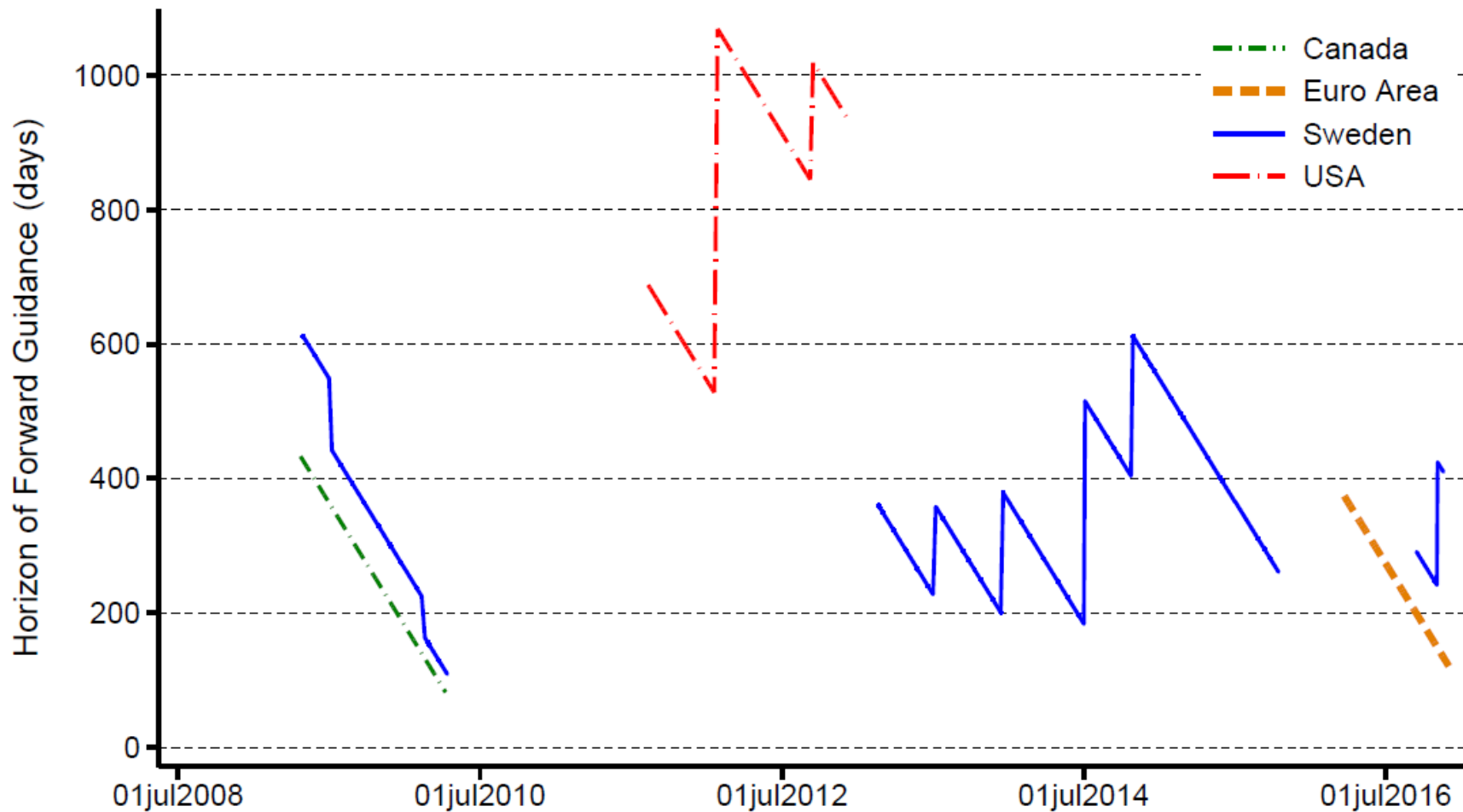
Japan, UK, USA



Time-contingent FG:

Canada, Euro area, Sweden, US

Split into short and long horizon (1.5 years)



- Daily returns of 2-year government bonds
- Macroeconomic surprises $s_t^{c,i,r} = \frac{a_t^{c,i,r} - e_t^{c,i,r}}{\sigma^{c,i,r}}$
 - Expectations from Bloomberg surveys
 - Business confidence, consumer confidence, CPI, GDP, industrial production, non-farm payroll employment, purchasing manager indices, retail sales, unemployment
 - Sign-adjusted (positive surprise implies a tightening of monetary policy, if anything)

$$\Delta R_t^{c,i} = \alpha^{c,i} + \alpha_{FG} FG_t^c + \beta s_t^{c,i} + \beta_{FG} FG_t^c s_t^{c,i} + \varepsilon_t^{c,i}$$






- Daily returns of 2-year government bonds

- Macroeconomic surprises $s_t^{c,i,r} = \frac{a_t^{c,i,r} - e_t^{c,i,r}}{\sigma^{c,i,r}}$

- Expectations from Bloomberg surveys
- Business confidence, consumer confidence, CPI, GDP, industrial production, non-farm payroll employment, purchasing manager indices, retail sales, unemployment
- Sign-adjusted (positive surprise implies a tightening of monetary policy, if anything)

$$\Delta R_t^{c,i} = \alpha^{c,i} + \alpha_{SG} SG_t^c + \alpha_{OG} OG_t^c + \alpha_{LTG} STG_t^c + \alpha_{STG} LTG_t^c + \beta_{SG} SG_t^c s_t^{c,i} + \beta_{OG} OG_t^c s_t^{c,i} + \beta_{LTG} STG_t^c s_t^{c,i} + \beta_{STG} LTG_t^c s_t^{c,i} + \varepsilon_t^{c,i}$$

Differential effect of FG types on responsiveness of bond yields

	(1)	(2)	(3)	(4)
No FG (β)	0.465*** (0.168)	0.464*** (0.168)	0.465*** (0.168)	0.465*** (0.168)
FG ($\beta + \beta_{FG}$)	0.518*** (0.159)			
 SG ($\beta + \beta_{SG}$)		0.226* (0.122)	0.223* (0.123)	0.223* (0.123)
 OG ($\beta + \beta_{OG}$)		0.424* (0.231)	0.423* (0.231)	0.422* (0.231)
 TG ($\beta + \beta_{TG}$)		0.920*** (0.212)	1.949*** (0.497)	
g (γ_g)			-1.815*** (0.583)	
 STG ($\beta + \beta_{STG}$)				1.252*** (0.256)
 LTG ($\beta + \beta_{LTG}$)				0.084 (0.089)

- 1 Effect of forward guidance on responsiveness of bond yields
- 2 **Rational expectations model with noisy market information**
- 3 Summary

More precise public information can be detrimental:

1. Externalities in pay-offs

Agents are less uncertain about fundamentals, ...

... but their use of the better information is socially inefficient.

(e.g. coordination motive as in Morris and Shin 2002,

Angeletos and Pavan 2007)

2. Externalities in information structure

Agents are less certain about fundamentals (due to crowding out of collective private information), ...

... and higher uncertainty decreases welfare.

(Morris and Shin 2005, Amador and Weill 2010)

Financial markets

- Agents invest in bonds with payoff $\tilde{\theta} \sim N(\bar{\theta}, \tau_{\theta}^{-1})$

- Agents' optimisation problem

$$\max_{Q_i} \left[(E[\tilde{\theta}|\Omega_i] - P) Q_i - \frac{1}{2} Q_i^2 \right]$$

- Net supply of bonds $\tilde{\kappa} \sim N(\bar{\kappa}, \tau_{\kappa}^{-1})$

- Market clearing

$$p = \int E[\theta|\Omega_i] di + \kappa$$

$$(\text{where } p = P - \bar{\theta} + \bar{\kappa}, \theta = \tilde{\theta} - \bar{\theta}, \kappa = \bar{\kappa} - \tilde{\kappa})$$

Central bank and forward guidance

- Central bank (CB) mandate related to fundamental

$$\tilde{\pi} \sim N(\bar{\pi}, \tau_{\pi}^{-1})$$

- CB observes $\pi = \tilde{\pi} - \bar{\pi}$ without noise,
is credible and time-consistent.
- FG commits to a reduced policy response to surprises in
fundamental (in deviation from pre-announced default path).

Central bank without FG

- No-FG Taylor rule: $\tilde{\theta}_t - \theta_t^* = \alpha^{TR} (\tilde{\pi}_t - \pi_t^*)$,
with $\alpha^{TR} > 0$ common knowledge

Central bank providing FG

- FG: **CB announces** α_t with $0 \leq \alpha_t < \alpha^{TR}$ at time $t-1$
(possibly also $\bar{\theta}_t \neq \theta_t^*$ and $\bar{\pi}_t \neq \pi_t^*$)
- Systematic policy response under FG: $\tilde{\theta}_t - \bar{\theta}_t = \alpha_t (\tilde{\pi}_t - \bar{\pi}_t)$
- In deviations from pre-announced path (single period): $\theta = \alpha \pi$
- Stronger FG lowers α .

Agents' information

1) Noisy **public signal**

$$y = \pi + \varepsilon$$

$$\varepsilon \sim N(0, \tau_\varepsilon^{-1})$$

2) Noisy **private signal**

$$s_i = \pi + \eta_i$$

$$\eta_i \sim N(0, \tau_\eta^{-1})$$

3) Heterogeneous interpretation of **market prices** (Vives and Yang 2017)

$$x_i = p + \xi_i = \int E[\theta | \Omega_i] di + \kappa + \xi_i$$

$$\xi_i \sim N(0, \tau_\xi^{-1})$$

Equilibrium

Agents form **expectations** according to

$$E[\theta|\Omega_i] = a\alpha s_i + b\alpha y + cx_i$$

Aggregating and substituting the signals yields...

$$\int E[\theta|\Omega_i] di = \frac{a}{1-c}\alpha\pi + \frac{b}{1-c}\alpha(\pi + \varepsilon) + \frac{c}{1-c}\kappa$$

... and **market price**

$$p = \frac{a\alpha}{1-c}\pi + \underbrace{\frac{b\alpha}{1-c}y}_{\phi} + \frac{1}{1-c}\kappa$$

news sensitivity

Agents' expectations

$$E[\theta|\Omega_i] = a\alpha s_i + b\alpha y + cx_i$$

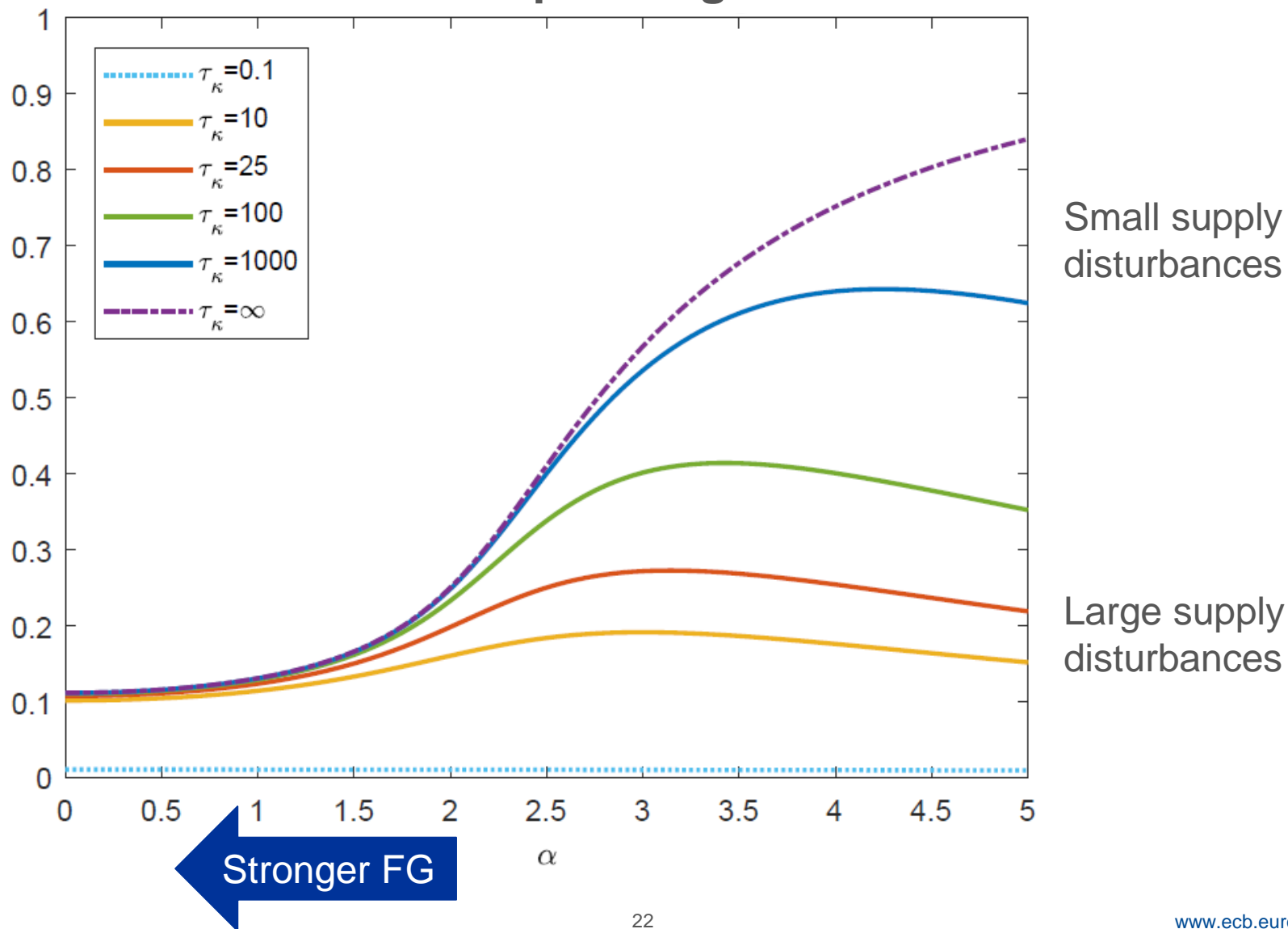
Structural disagreement $\Delta_s = a^2\alpha^2\tau_\eta^{-1}$

Behavioral disagreement $\Delta_b = c^2\tau_\xi^{-1}$

Total disagreement $\Delta = \Delta_b + \Delta_s$

The precision of the price signal is nonlinear in the strength of guidance.

Precision of market price signal about θ



News sensitivity

$$\phi = \frac{\alpha \tau_{\varepsilon}}{\frac{1}{1-c} \tau_{\eta} + \tau_{\varepsilon} + \tau_{\pi}}$$

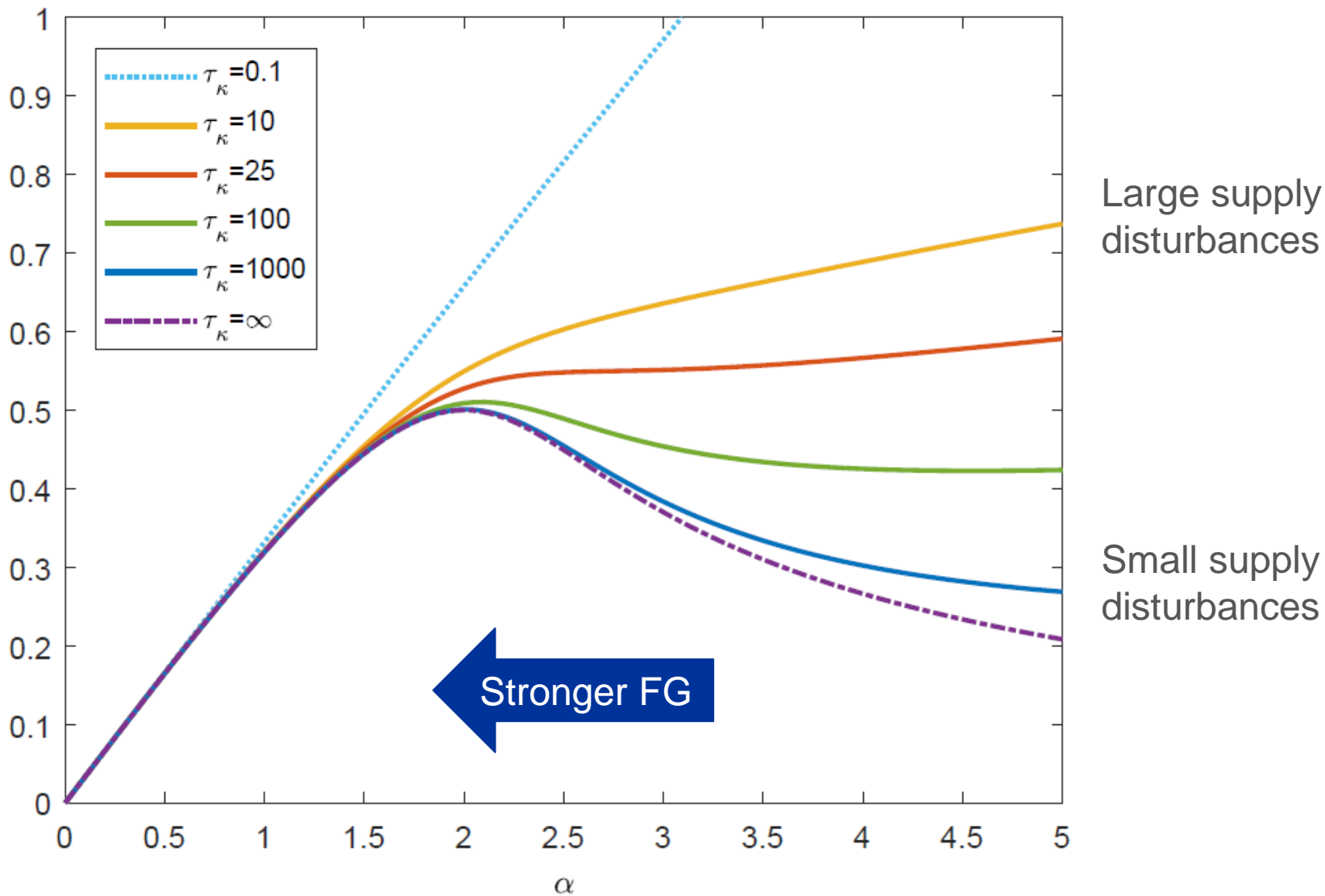
- c is a real root of fixed-point equation

$$\frac{\frac{1}{1-c} \tau_{\eta}}{\left(\frac{1}{1-c} \tau_{\eta} + \tau_{\varepsilon} + \tau_{\pi}\right)^2} \alpha^2 - c \left[\frac{1}{(1-c)^2} \frac{1}{\tau_{\kappa}} + \frac{1}{\tau_{\xi}} \right] = 0$$

- $c \in (0,1)$ and $c \rightarrow 0^+$ as $\alpha \rightarrow 0^+$ or $\tau_{\eta} \rightarrow 0^+$
- If no endogenous price signal (i.e. $c = 0$):
 ϕ strictly increases in α , (same for disagreement)
- For $\tau_{\xi} \rightarrow \infty$, ϕ is a monotonic function of α
- For $\tau_{\kappa} \rightarrow \infty$, ϕ is a non-monotonic function of α

News sensitivity can be hump-shaped if supply disturbances are sufficiently small.

News sensitivity $\Phi(\alpha)$



Limiting case $\tau_\kappa \rightarrow \infty$:

- $\Phi(\alpha)$ is non-monotonic
- Maximum of $\Phi(\alpha)$ at $c=1/2$, i.e. at

$$\alpha^* = \sqrt{\frac{\tau_\eta}{\tau_\xi}} + \frac{1}{2} \frac{\tau_\varepsilon + \tau_\pi}{\sqrt{\tau_\eta \tau_\xi}}$$

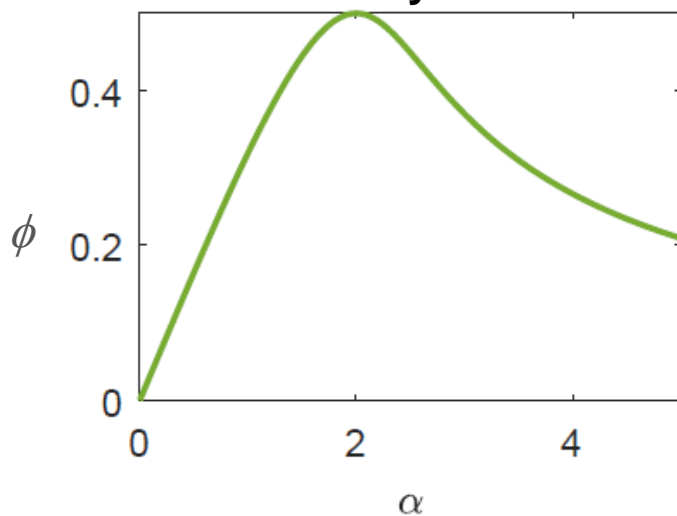
- The better markets aggregate information, the lower α^* .
I.e. news sensitivity peaks at stronger guidance.

Weak forward guidance lowers overall disagreement, but can increase uncertainty.

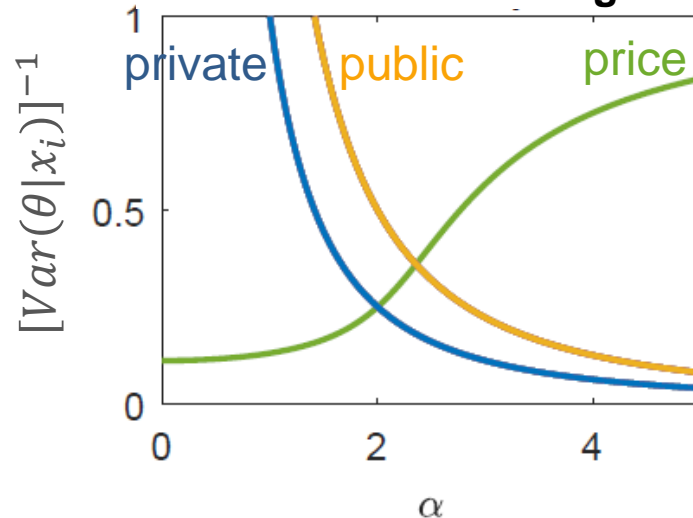
Case

$\tau_K \rightarrow \infty$

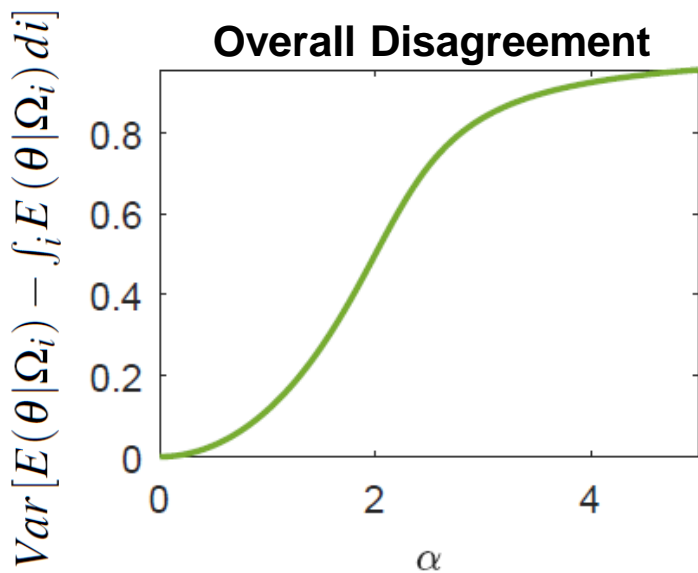
Sensitivity to News



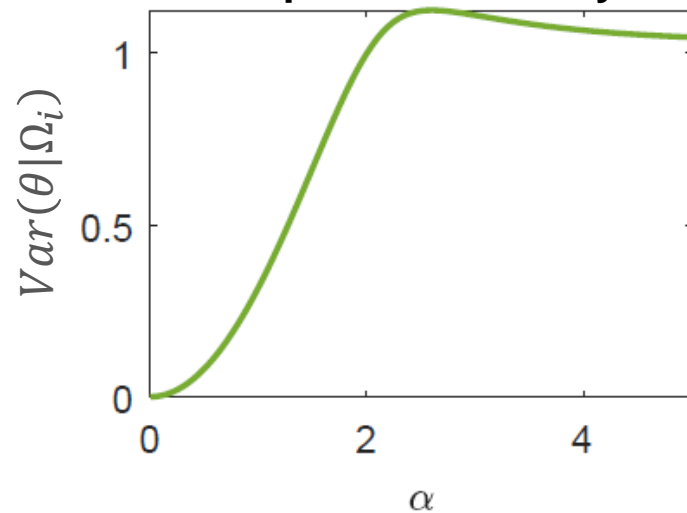
Precision of Price Signal



Overall Disagreement



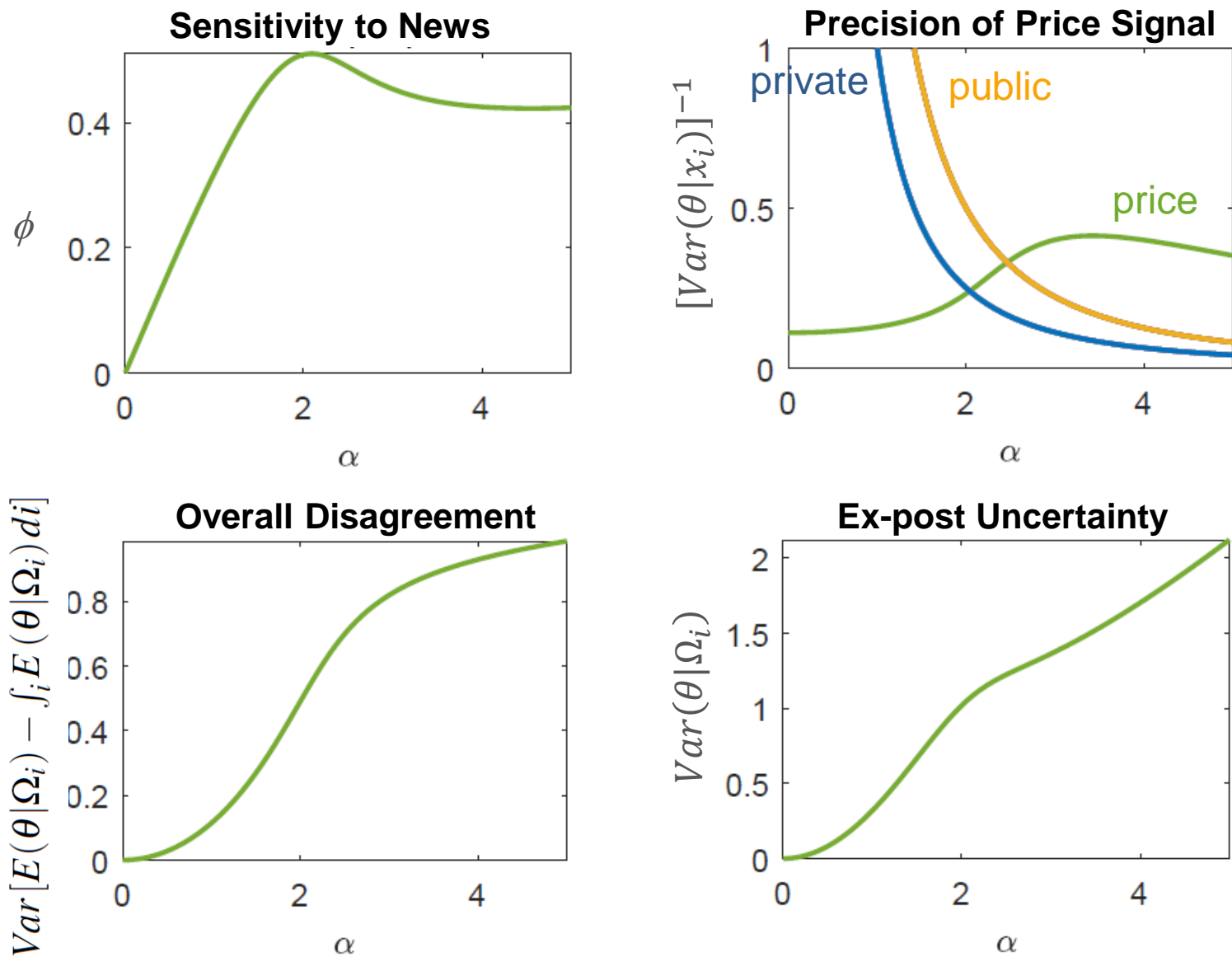
Ex-post Uncertainty



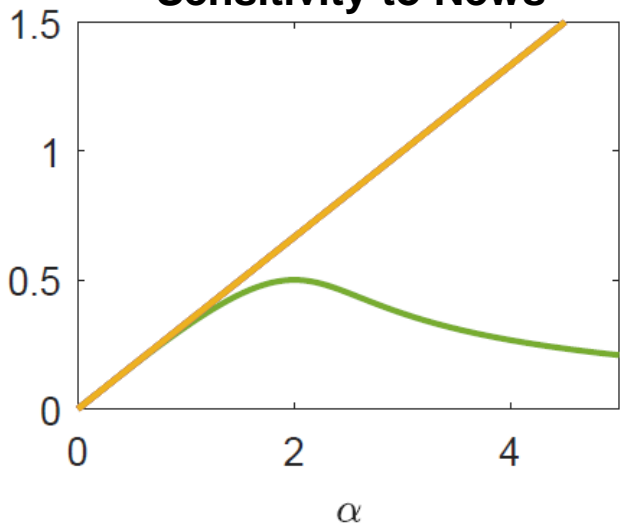
In presence of large supply disturbances, these effects are less pronounced.

Case

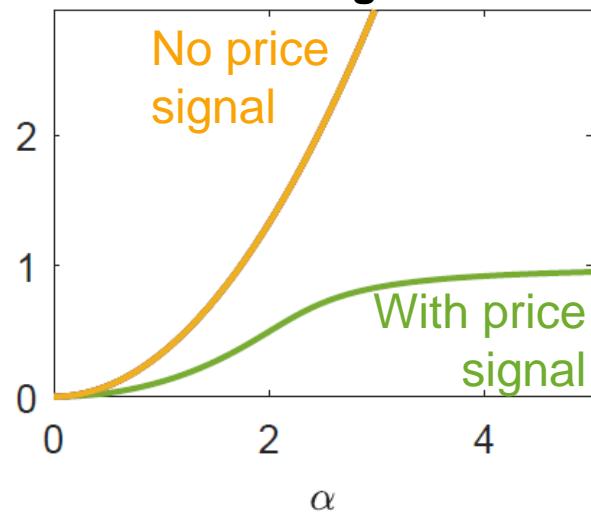
$$\tau_K = 100$$



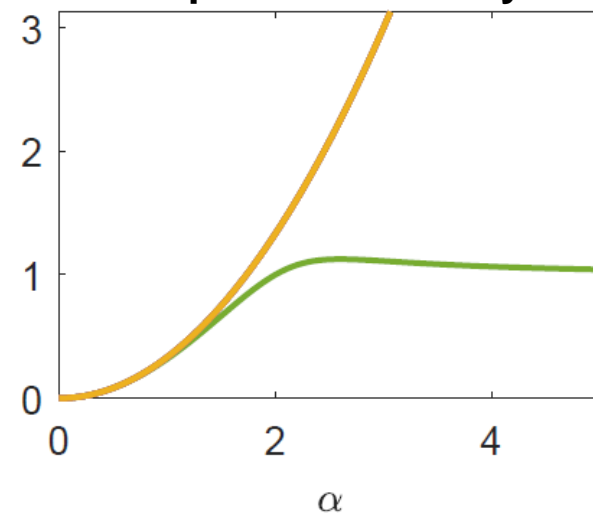
Sensitivity to News



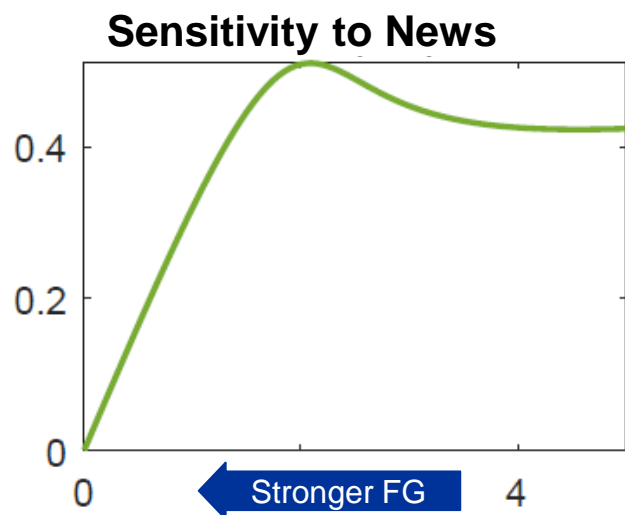
Overall Disagreement



Ex-post Uncertainty



- 1 Effect of forward guidance on responsiveness of bond yields
- 2 Rational expectations model with noisy market information
- 3 **Summary**



- **Effect of forward guidance depends on its strength**
 - Sensitivity of bond yields to news *increased* under short-horizon FG
 - Effect differs by FG-type (e.g. no effect of open-ended FG on news responsiveness)
- In line with **agents endogenously adjusting their reliance on private, public, and price signals**
 - Effect of change in FG depends on strength of guidance already in place
 - Marginally increasing weak guidance may fail to reduce uncertainty